IN THE CLAIMS:

1   1. (CURRENTLY AMENDED) In a service-provider network comprising a plurality of

2   interconnected provider edge routers and transit routers, a router ~~comprising circuitry that~~

3   method comprising the following steps:

4   A)   ~~receives~~ receiving from a source not in the service-provider network pack-

5   ets that include destination-address fields that specify final destinations

6   that also are not located in the service-provider network:

7   B)   for each of a plurality of such received packets:

8   i)   ~~makes~~ making a routing decision based not only on the contents of

9   that packet's destination-address field but also on the source from

10   which it receives that packet;

11   ii)   ~~inserts~~ inserting into the packet an internal-routing field, deter-

12   mined at least in part in accordance with the source from which the

13   edge router received the packet, that specifies a route to an inter-

14   face on another of the provider edge routers; and

15   iii) ~~forwards~~ forwarding the resultant packet to another router in the

16   service-provider network in accordance with the routing decision;

17   and

18   C)   ~~receives~~ receiving, from other routers in the service- provider network,

19   packets that include internal-routing fields and destination-address fields

20   and:

21   i)   ~~forwards~~ forwarding some such packets without their internal-

22   routing fields to routers, not located in the service-provider net-

23   work, that it selects in accordance with a routing decision based on

24   the contents of the packets' internal-routing fields; and

25   ii)   for other such packets, ~~makes~~ making routing decisions based on

26   the contents of those packets' internal-routing fields without refer-

27   ence to those of their destination-address fields, and, in accordance

2

28   with those routing decisions, forwards those packets to other
29   routers in the service-provider network.

1   2. (CURRENTLY AMENDED) A router~The router method~ as defined in claim 1 ~that~
2   ~further comprising the steps of~:
3   A)   ~makes~making~ routing decisions based on the contents of reachability mes-
4   sages that it receives;
5   B)   ~is connected to~determining that~ at least first and second pluralities of cus-
6   tomer routers, ~with which it respectively associates~are associated with the~
7   first and second VPN IDs;
8   C)   ~when it receives~receiving~ a reachability message concerning a given net-
9   work-address range from a customer router with which it associates a
10   given VPN ID, ~sends~and in response sending~ a reachability message con-
11   cerning the combination of that network-address range and the given VPN
12   ID to each router in the service-provider network that is connected to a
13   customer router associates with the same VPN ID; and
14   D)   ~when it receives~receiving~ a reachability message concerning the combina-
15   tion of a network-address range and a given VPN ID associated with a
16   customer router ~to which it is connected, it sends~and sending~ that cus-
17   tomer router a reachability message concerning that network-address
18   range.

1   3. (CURRENTLY AMDNED) A router~The router method~ as defined in claim 2 that
2   uses an external gateway protocol to send other routers in the service-provider network
3   the reachability message concerning the combination of network-address range and the
4   given VPN ID.

1   4. (CURRENTLY AMENDED) A router~The router method~ as defined in claim 3
2   wherein the external gateway protocol that the router uses to send other routers in the

3

3 service-provider network the reachability message concerning the combination of net-
4 work-address range and the given VPN ID is the Border Gateway Protocol.

1 | 5. (CURRENTLY AMENDED) A router The router method as defined in claim 2
2 wherein:

3   A)   the internal-routing field includes both an egress-router field and an
4   egress-channel field;

5   B)   the router bases its routing decisions concerning the packets that it for-
6   wards without reference to their destination-address fields on the internal-
7   routing fields' egress-router fields without reference to their egress-
8   channel fields; and

9   C)   the router bases its selections of the routers not located in the service-
10   provider network to which it forwards packets containing internal-routing
11   fields on the internal-routing fields' egress-channel fields.

1 | 6. (CURRENTLY AMENDED) A router The router method as defined in claim 5 that
2 maintains an information base that associates internal-routing-field contents with routers
3 to which it is connected in the service-provider network and forwards packets containing
4 internal-routing fields to the routers with which the information base associates the con-
5 tents of those internal-routing fields.

1 | 7. (CURRENTLY AMENDED) A router The router method as defined in claim 6
2 wherein:

3   A)   the information base associates at least certain internal-routing-field con-
4   tents with replacement internal-routing-field contents, and

5   B)   the router replaces the certain internal-routing-field contents with the re-
6   placement internal-routing-field contents in packets that it forwards.

4

1 | 8. (CURRENTLY AMENDED) ~~A router~~The router method as defined in claim 7 that
2 | replaces internal-routing-field contents replaces the contents of some packets' egress-
3 | router fields without replacing the contents of their egress-channel fields

1 | 9. (PREVIOUSLY PRESENTED) A method for use in a router, said method comprising
2 | the steps of:
3 | receiving a data packet having a destination address;
4 | determining if said data packet is received from a router in a Virtual Private Net-
5 | work (VPN) or a provider network;
6 | performing, in response to a data packet received from a VPN router:
7 | i. adding a first forwarding tag based on an egress router associated with
8 | said destination address and a second tag that identifies the channel associated with the
9 | destination address, and forwarding said data packet to another provider router; and
10 | performing, in response to a data packet having a forwarding tag received from a
11 | provider network router:
12 | ii. if said data packet is next being forwarded to another provider router,
13 | forwarding said data packet according to said first tag to said another provider router; and
14 | iii. if said data packet is next being forwarded to said destination VPN,
15 | removing said first forwarding tag from said data packet, and forwarding said packet to
16 | the destination address, identified in the second tag.

1 | 10. (PREVIOUSLY PRESENTED) The method as in claim 9 further comprising the
2 | steps of:
3 | receiving reachability messages; and
4 | adding said tag in accordance with the contents of said reachability message.

1 | 11. (PREVIOUSLY PRESENTED) The method as in claim 9 further comprising the
2 | step of:
3 | sending to other routers in said provider network a reachability message.

5

1   12. (PREVIUOSLY PRESENTED) The method as in claim 11 further comprising the

2   step of:

3   using an external gateway protocol for said reachability message.

1   13. (PREVIOUSLY PRESENTED) The method as in claim 12 further comprising the

2   step of:

3   using the Border Gateway Protocol (BGP) for said external gateway protocol.

1   14. (PREVIOUSLY PRESENTED) The method as in claim 9 further comprising: using

2   said router as a transit router.

1   15. (PREVIOUSLY PRESENTED) The method as in claim 9 further comprising: using

2   said router as a provider edge router.

1   16. (PREVIOUSLY PRESENTED) A method for use in a router, said method compris-

2   ing the steps of:

3   receiving a data packet from a router;

4   reading a type field from a header of said packet;

5   if the type field indicates that the packet has a standard router to router type, then

6   adding a first tag and transmitting the tagged packet to a provider router;

7   if the packet has a first and a second tag, forwarding the packet to a provider

8   router; wherein the first tag identifies an egress router and the second tag identifies a

9   channel to a customer router associated with a destination address, and

10   if the packet has only the second tag, forwarding the packet to the customer

11   router.

1   17. (CURRENTLY AMENDED) A router, comprising:

2   an ingress port to receive a data packet originating in a Virtual Private Network

3   (VPN), said packet having a destination address;

4   ~~circuitry to add~~ means for attaching first ~~and a~~ second forwarding tags to said data

5   packet, said first tag based on an egress router and the second tag identifying a channel

6

6   to a customer router in a destination VPN, said ~~circuitry~~ router responding to data packets

7   received directly from a VPN edge router;

8   ~~circuitry to remove~~ means for removing a forwarding tag from said data packet,

9   ~~said circuitry~~ and responding to data packets next being forwarded to a VPN edge router;

10   and

11   an egress port to forward said data packet according to said tag.

1   18. (PREVIOUSLY PRESENTED) The router as in claim 17 further comprising:

2   an ingress port to receive reachability messages, wherein said forwarding tag is

3   labeled in accordance with said reachability message.

1   19. (PREVIOUSLY PRESENTED) The router as in claim 17 further comprising: said

2   router is in a provider network.

1
2   20. (PREVIOUSLY PRESENTED) The router as in claim 19 further comprising:

3   an egress port to send to other routers in said provider network a reachability mes-

4   sage.

1   21. (PREVIOUSLY PRESENTED) The router as in claim 20 further comprising: said

2   reachability message uses an external gateway protocol.

1   22. (PREVIOUSLY PRESETNED) The router as in claim 21 further comprising: said

2   external gateway protocol is the Border Gateway Protocol (BGP).

1   23. (PREVIOUSLY PRESENTED) The router as in claim 17 further comprising: said

2   router is a transit router.

1   24. (PREVIOUSLY PRESENTED) The router as in claim 17 further comprising: said

2   router is a provider edge router.

7

1   25. (PREVIOUSLY PRESENTED) A router, comprising:

2   means for receiving a data packet having a destination address;

3   means for determining if said data packet is received from a route: in a Virtual

4   Private Network (VPN) or a provider network;

5   means for performing, in response to a data packet received from a VPN router:

6   i. adding first and second forwarding tags the first based on said destina-

7   tion address and the second based on said VPN and forwarding said data packet to an-

8   other provider router; and

9   means for performing, in response to a data packet having a forwarding tag re-

10   ceived from a provider network router:

11   ii. if said data packet is next being forwarded to another provider router,

12   forwarding said data packet according to said tags to said another provider router; and

13   iii. if said data packet is next being forwarded to said VPN, removing said

14   first forwarding tag from said data packet, and forwarding said packet to said VPN.

1   26. (PREVIOUSLY PRESENTED) A computer readable media, comprising: said com-

2   puter readable media containing instructions for execution in a processor for the practice

3   of the method of claim 1 or claim 16.

1   27. (PREVIOUSLY PRESENTED) Electromagnetic signals propagating on a computer

2   network, comprising: said electromagnetic signals carrying instructions for execution on

3   a processor for the practice of the method of claim 1 or claim 16.

8